DEPARTMENT OF **EARTH AND ENVIRONMENTAL SCIENCES**
K.U.LEUVEN - BELGIUM

Research Foundation Flanders
Opening new horizons

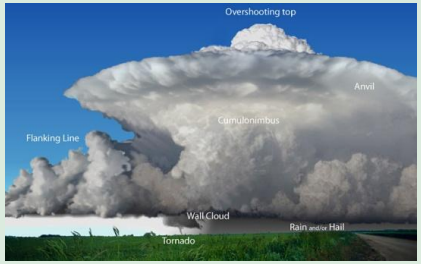
Amplification of extreme precipitation response to climate change over Lake Victoria

W. Thiery[1], E. L. Davin[2], S. I. Seneviratne[2], K. Bedka[3] and N. van Lipzig[1]

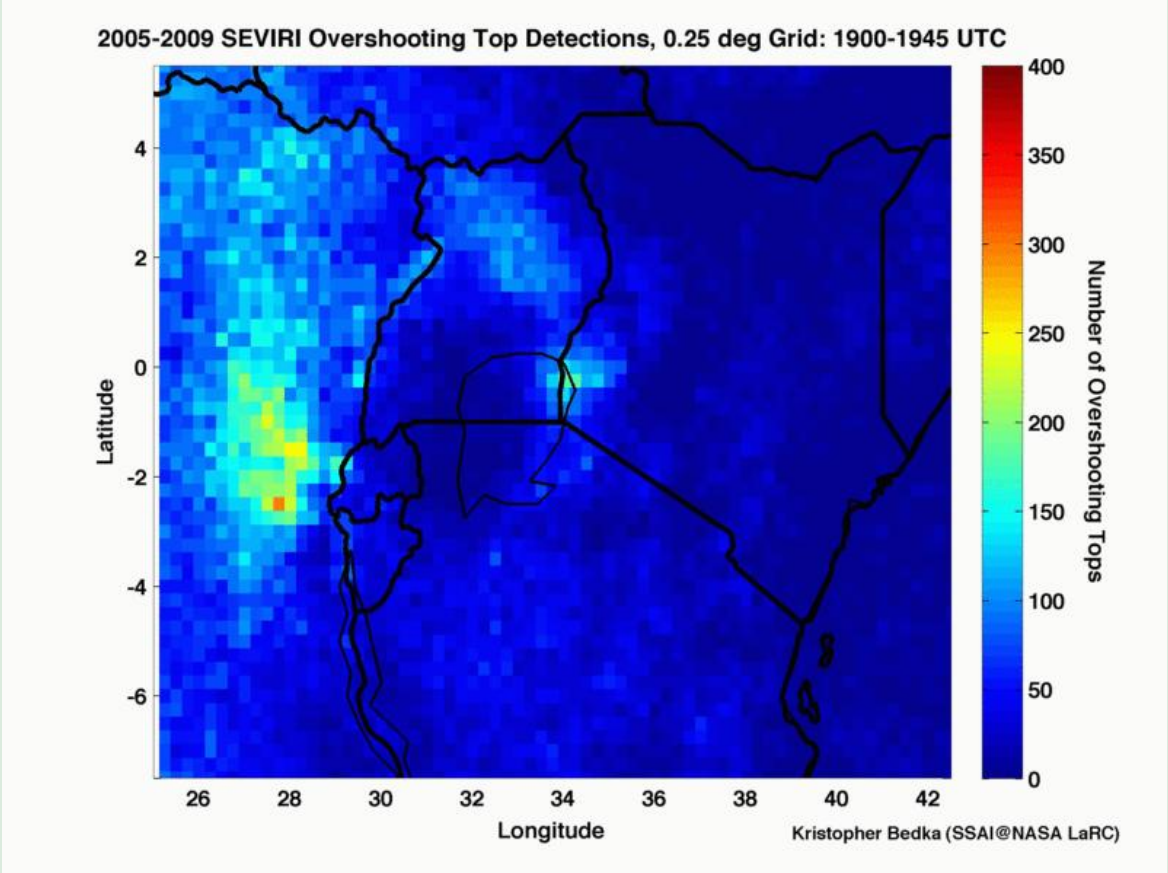
[1] EES, University of Leuven, Belgium
[2] IACETH, Swiss Federal Institute of Technology, Switzerland
[3] NASA Langley Research Center, USA

DEPARTMENT OF **EARTH AND ENVIRONMENTAL SCIENCES**
K.U.LEUVEN - BELGIUM

Motivation and objectives

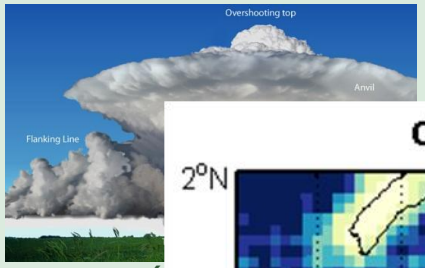


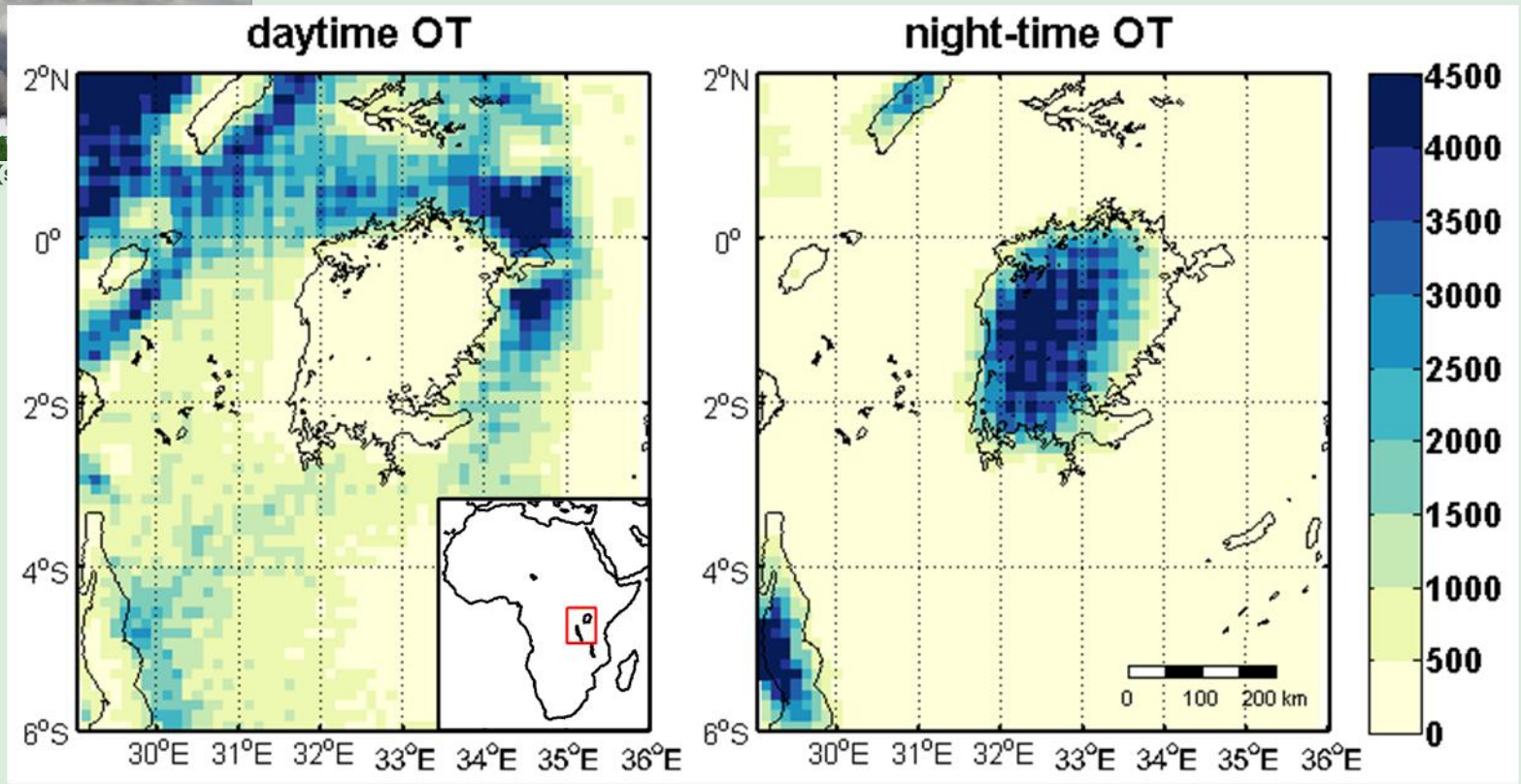
(severe-wx.pbworks.com)



DEPARTMENT OF **EARTH AND ENVIRONMENTAL SCIENCES**
K.U.LEUVEN - BELGIUM

Motivation and objectives





clear lake imprint on thunderstorm occurrence

Motivation and objectives

(Lake Kivu)

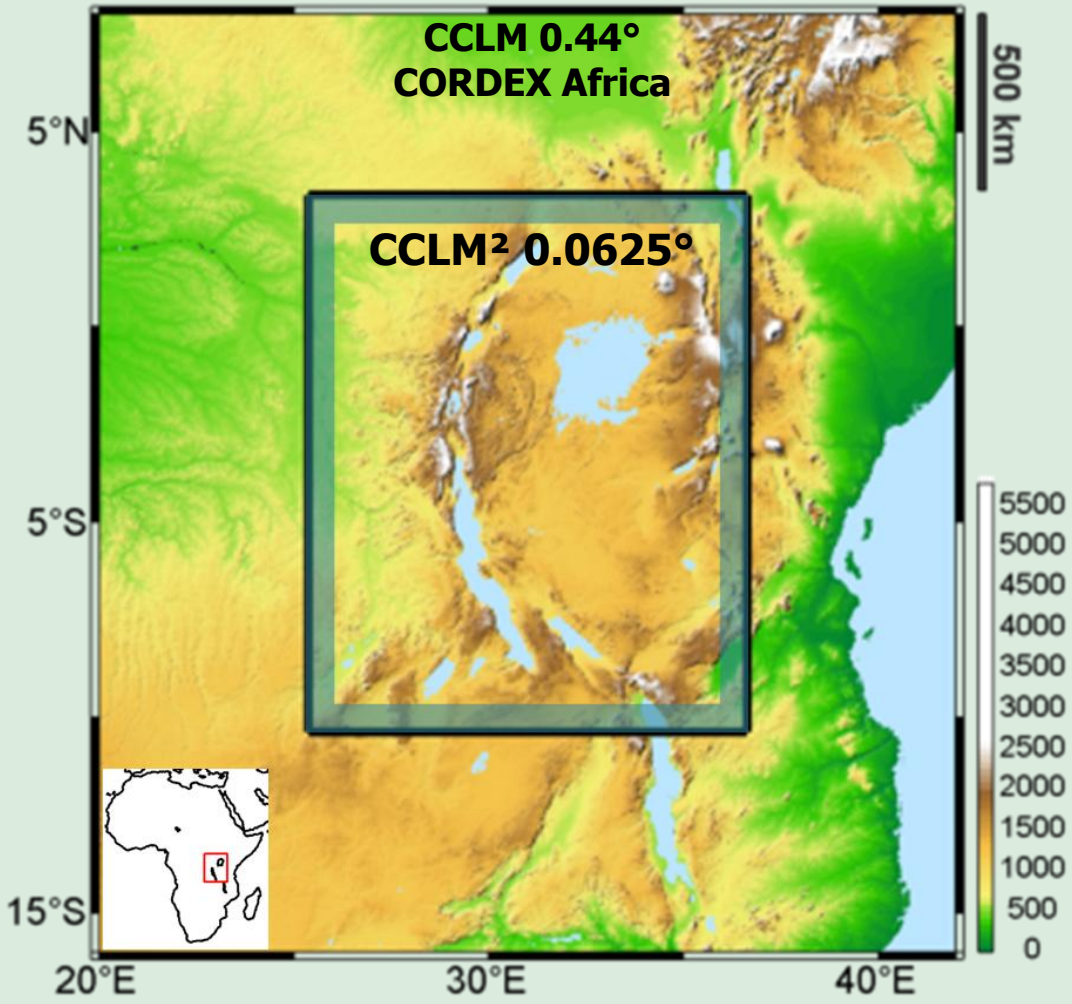
(www.cnn.com)

model skill?

future climate change?

DEPARTMENT OF **EARTH AND ENVIRONMENTAL SCIENCES**
K.U.LEUVEN - BELGIUM

CCLM² model setup



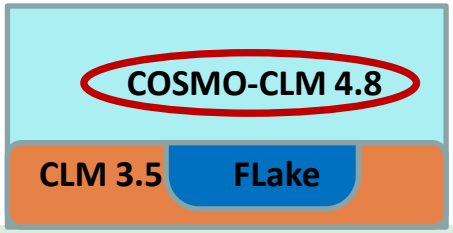
COSMO-CLM 4.8
(CORDEX-Africa set-up)

CLM 3.5 | FLake

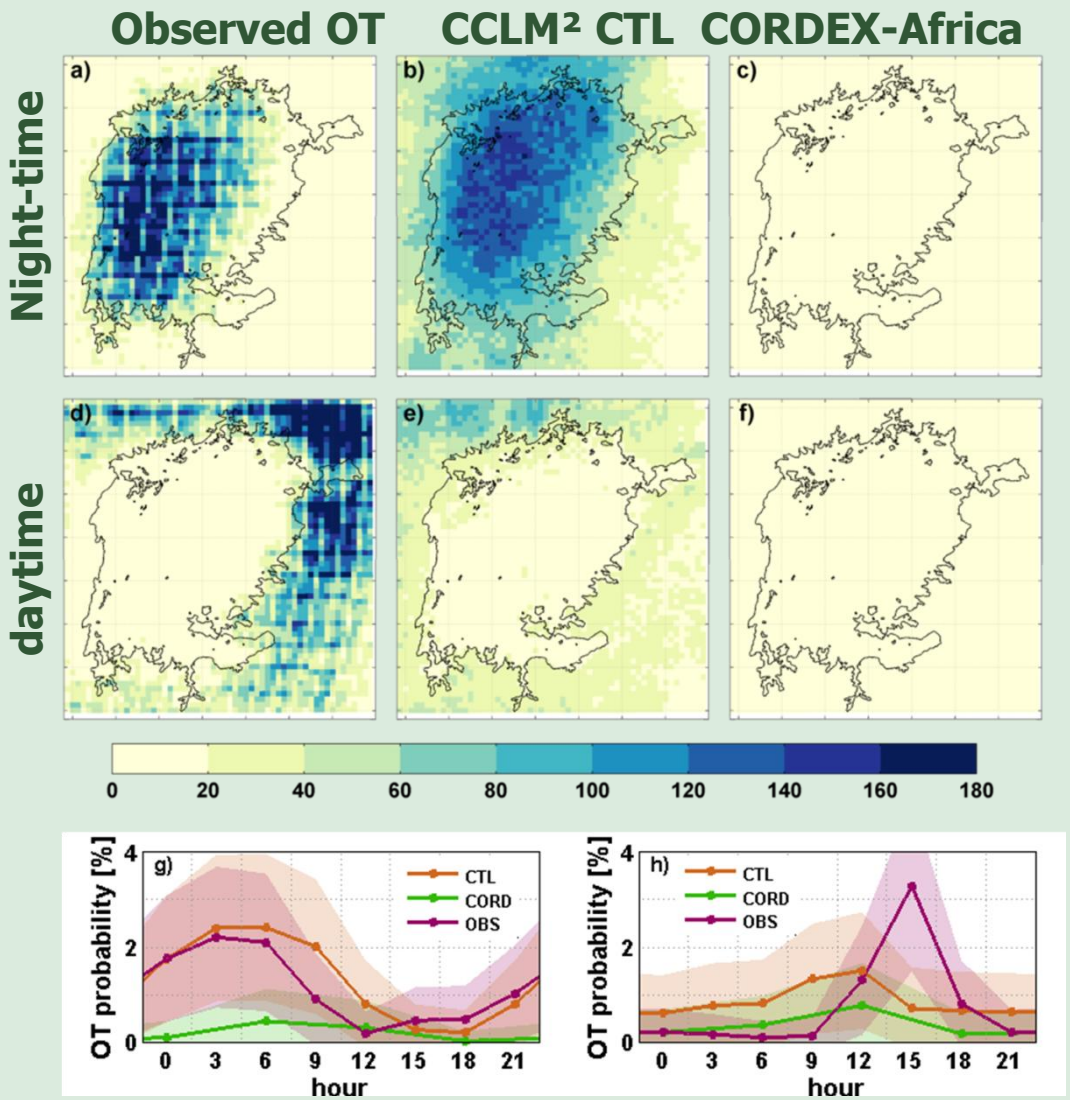
(Davin and Seneviratne, 2012)

"RCP8.5" (1989-2008)

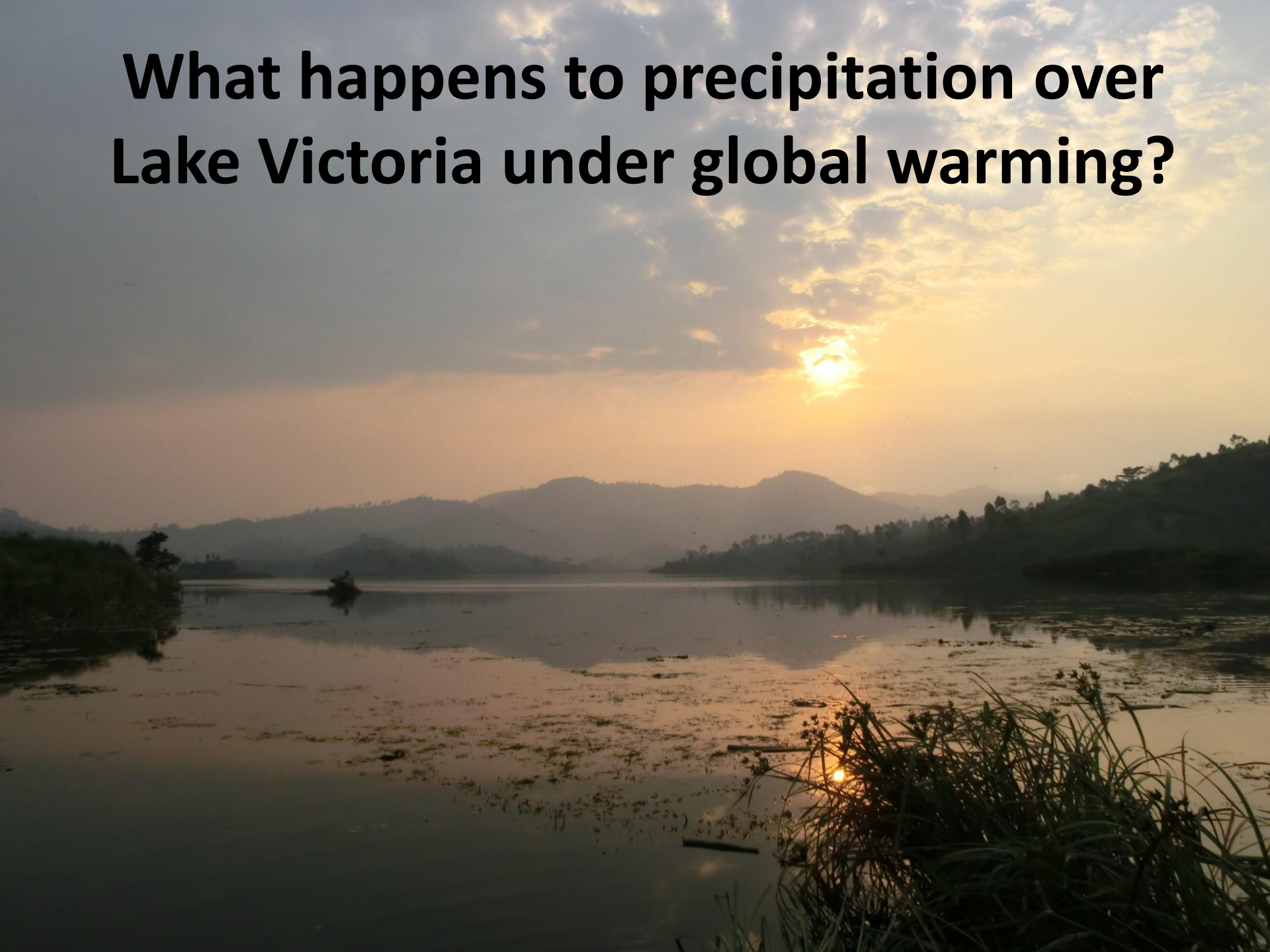
How well does our model perform?



Evaluation: OT (HTOP_CON>15km)

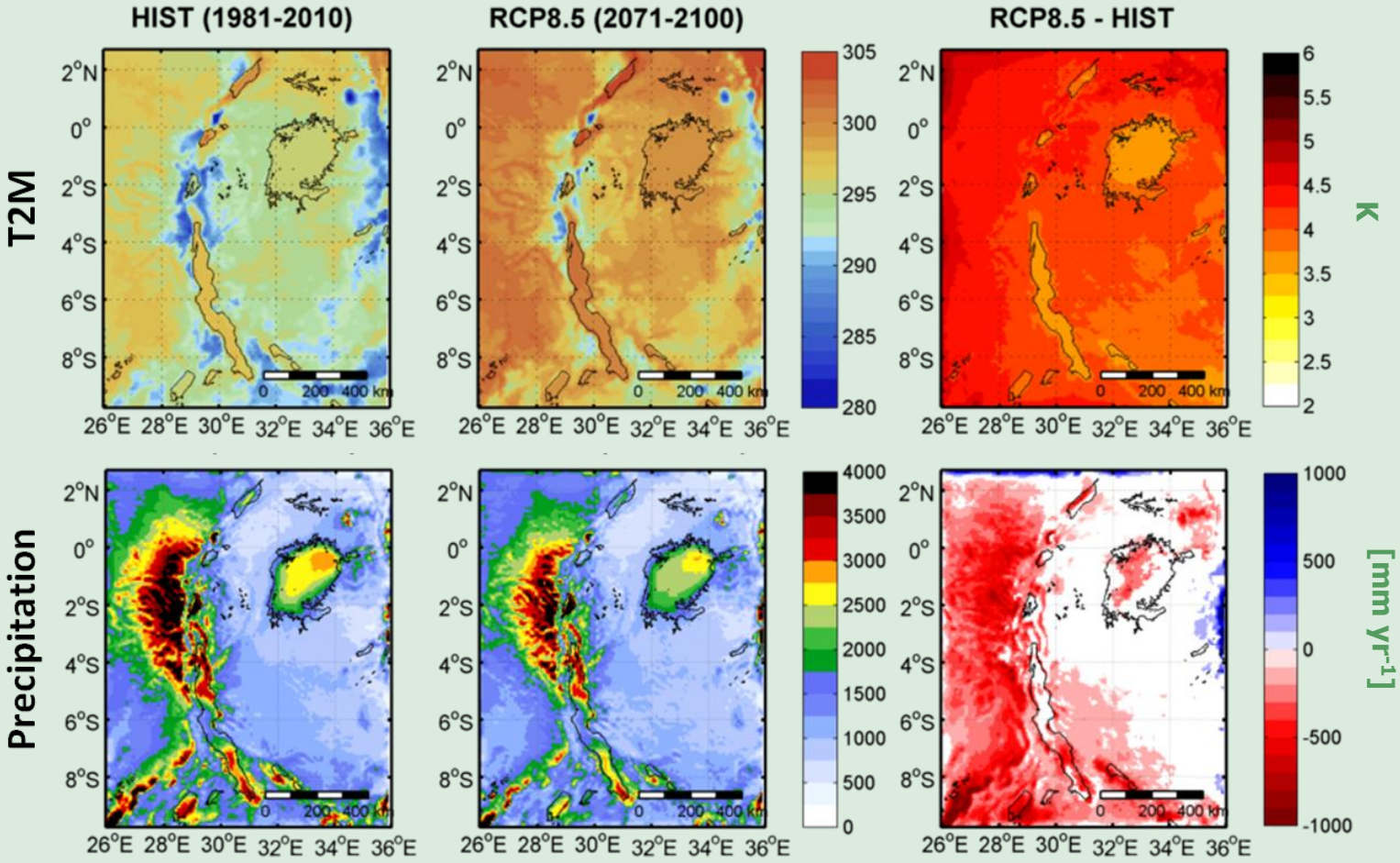


What happens to precipitation over Lake Victoria under global warming?



DEPARTMENT OF **EARTH AND ENVIRONMENTAL SCIENCES**
K.U.LEUVEN - BELGIUM

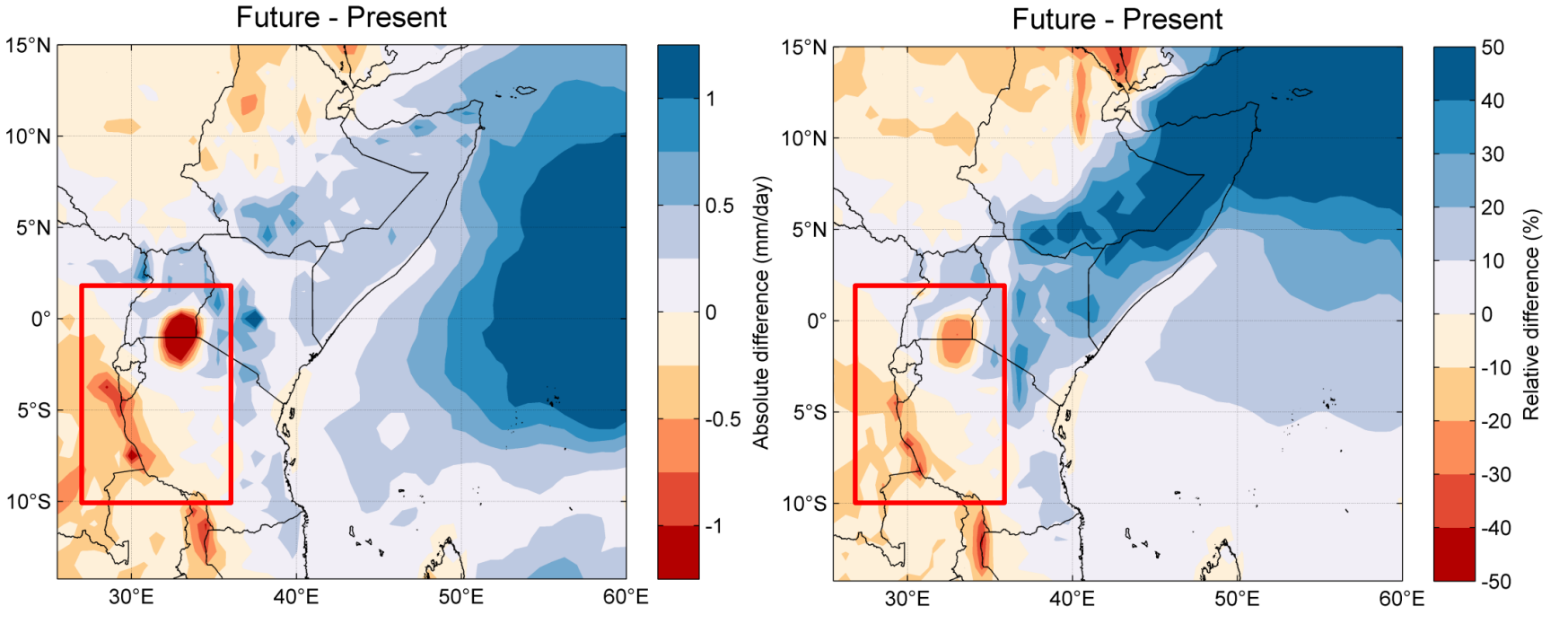
Precipitation under climate change



CCLM²: - 7.95 %

DEPARTMENT OF **EARTH AND ENVIRONMENTAL SCIENCES**
K.U.LEUVEN - BELGIUM

CORDEX (RCP8.5 ensemble mean)

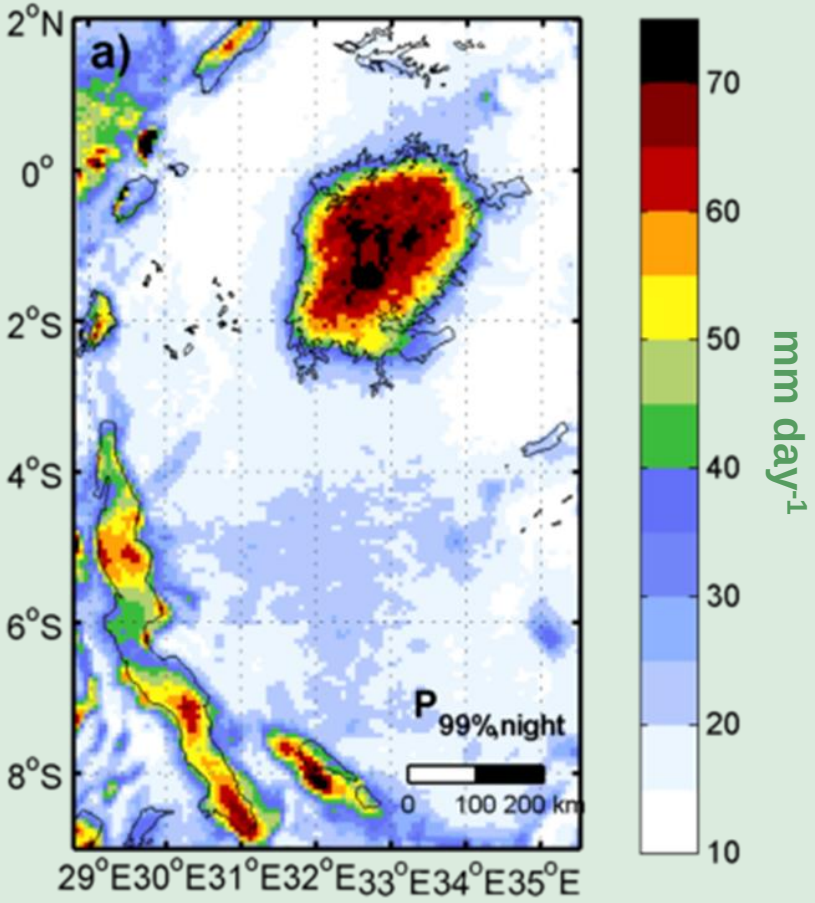


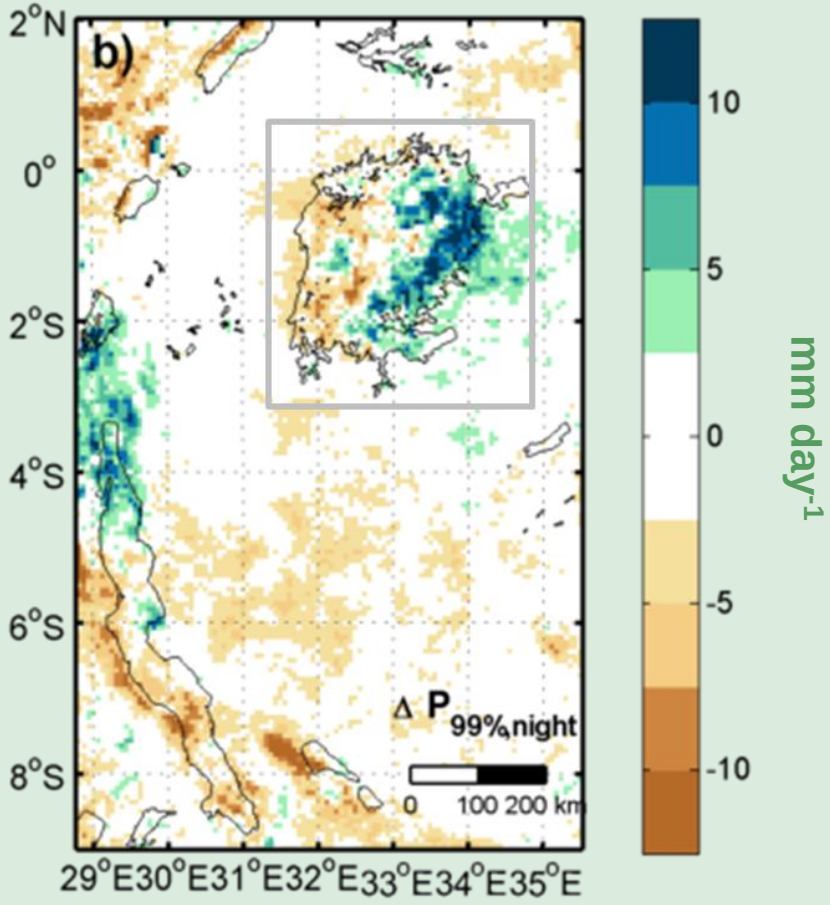
(courtesy of N. Souverijns)

CCLM² projections are consistent with CORDEX-Africa ensemble

DEPARTMENT OF **EARTH AND ENVIRONMENTAL SCIENCES**
K.U.LEUVEN - BELGIUM

Climate change impact on extremes

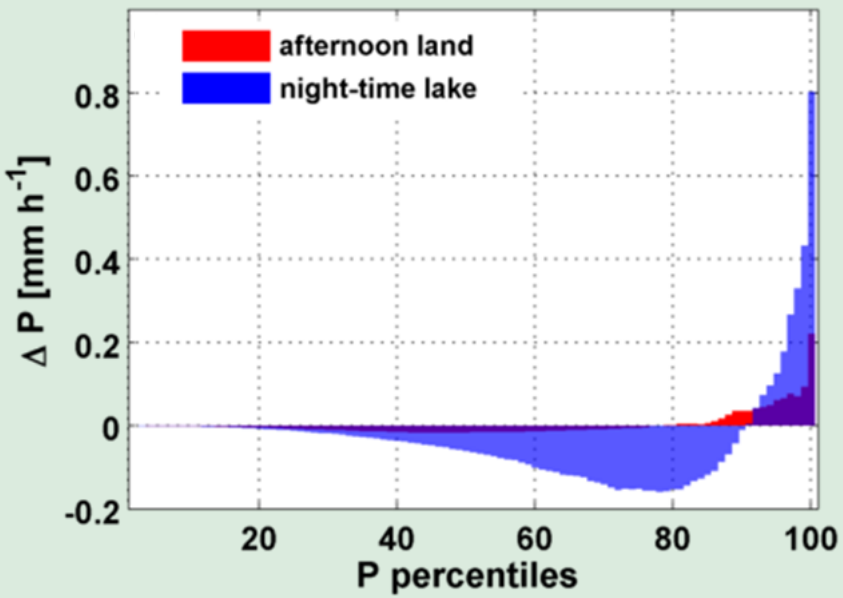




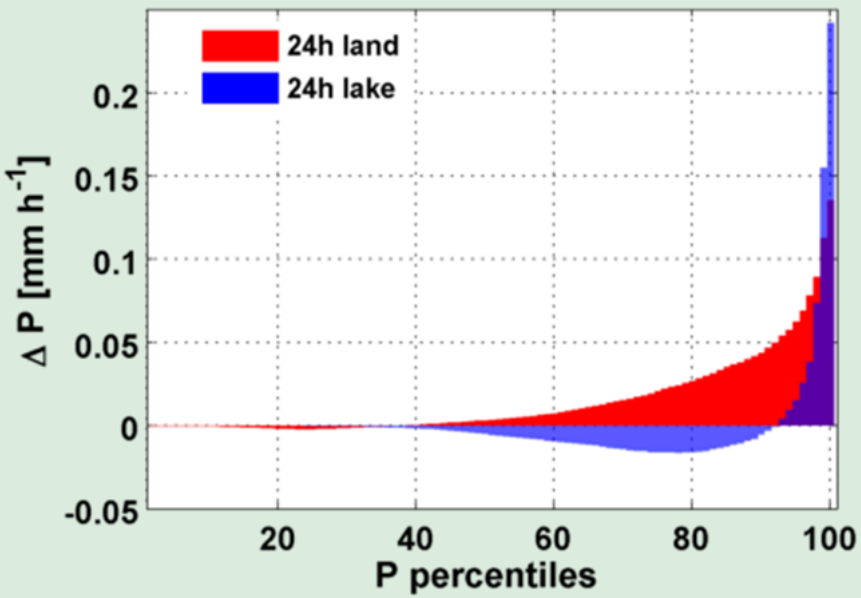
DEPARTMENT OF **EARTH AND ENVIRONMENTAL SCIENCES**
K.U.LEUVEN - BELGIUM

Climate change impact on extremes

CCLM²

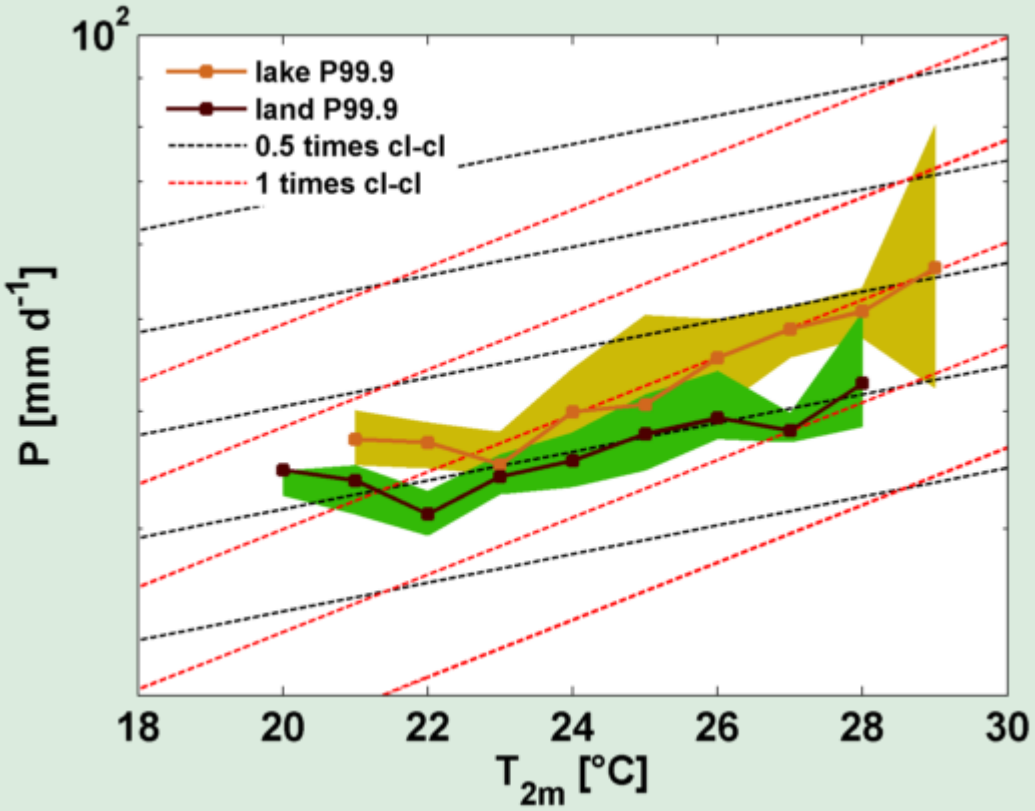


CORDEX-Africa



1. **robust?**
2. **why?**

Clausius-Clapeyron scaling



Scaling over the lake twice as strong compared to land

Thank you for your attention

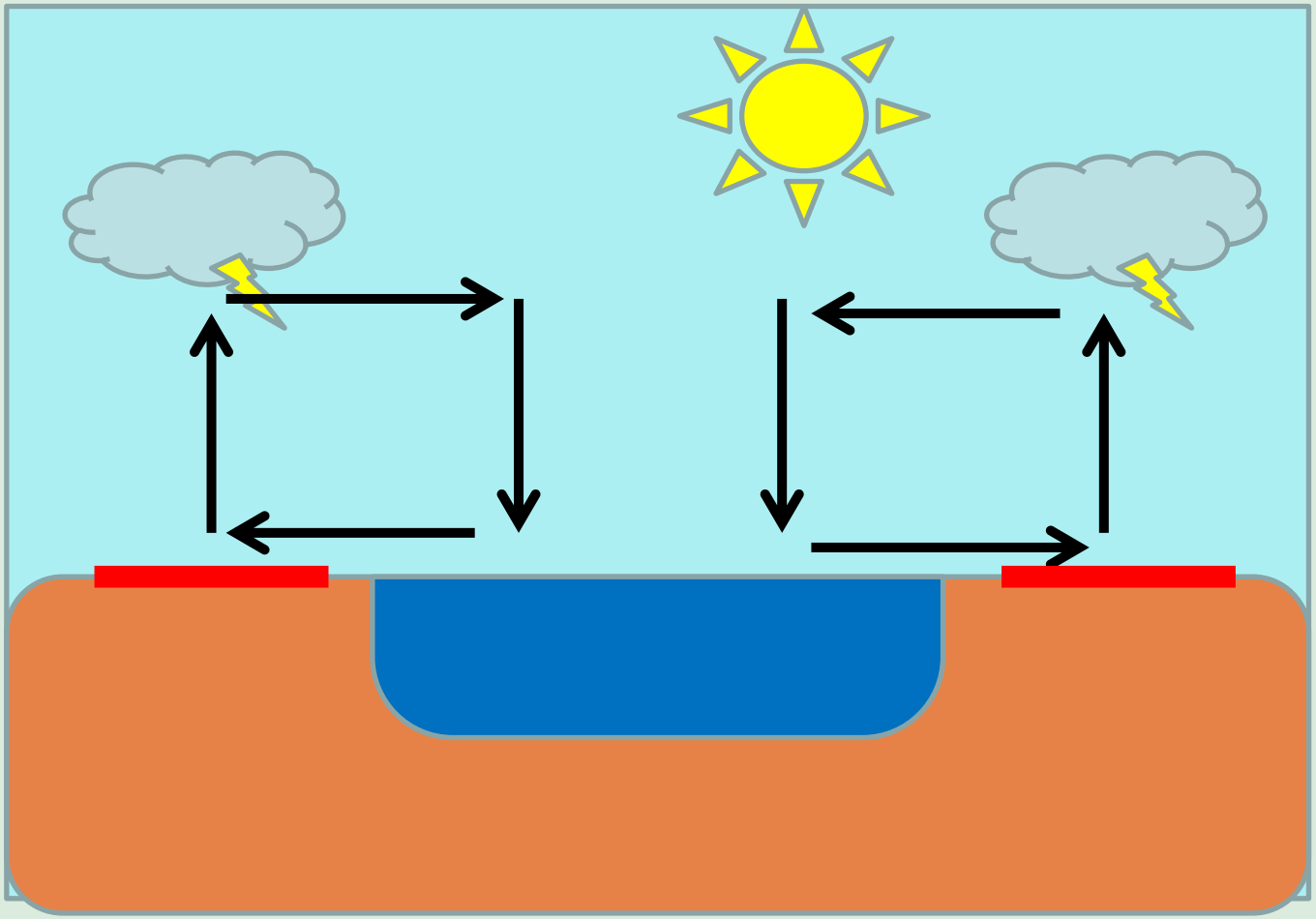
Acknowledgements: FWO, BELSPO

wim.thiery@ees.kuleuven.be

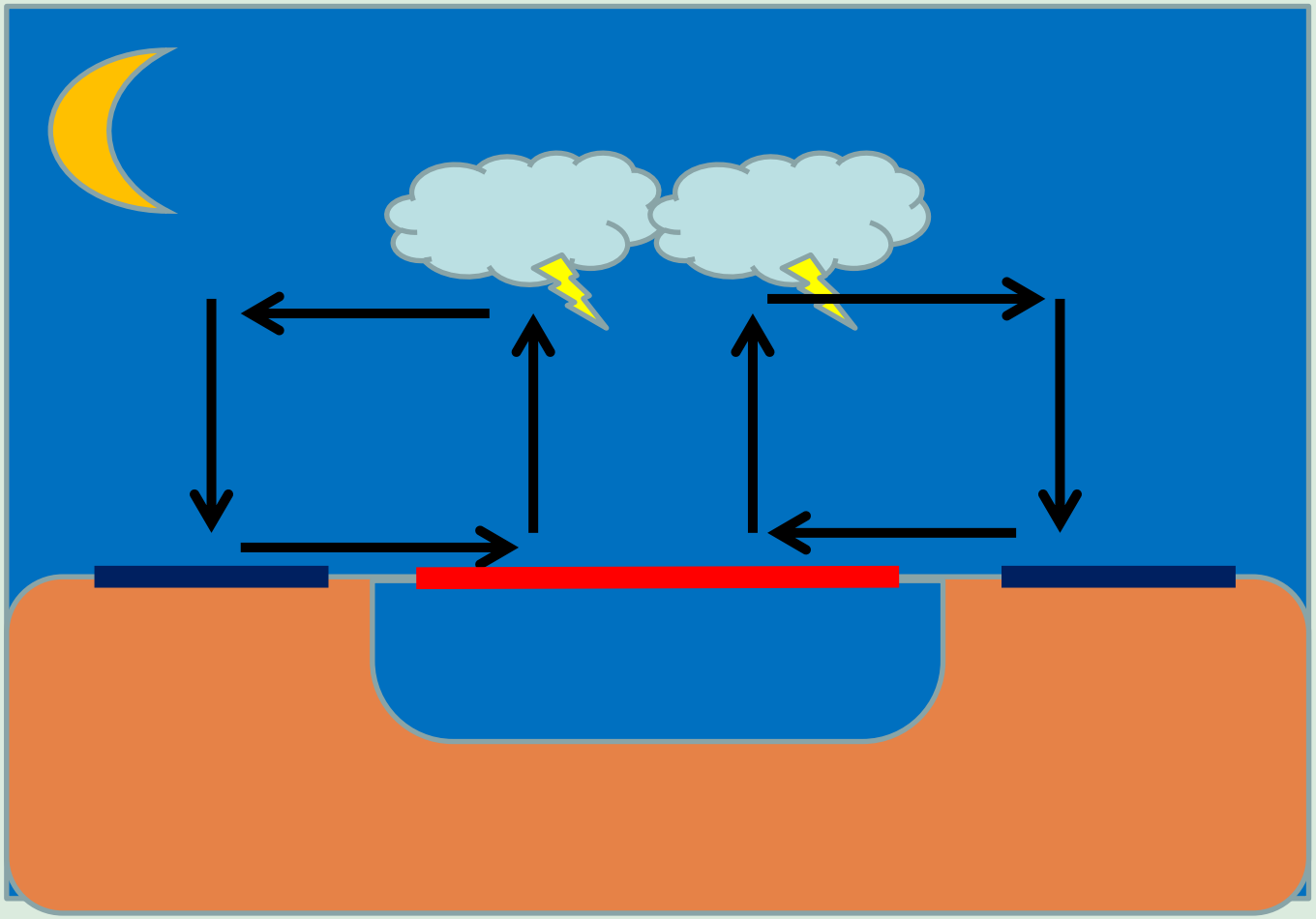
Conclusions

- Extremes and climate change
  - using a high-resolution RCM simulation we project an average precipitation decrease over the AGL…
  - … consistent with the CORDEX-Africa ensemble mean projection for the region.
  - despite the average precipitation decrease, LV extremes will become more intense under global warming
  - this result is robust and more pronounced compared to surrounding land
  - Clausius-Clapeyron scaling only holds over LV where future evaporation increase ensure moisture availability

Lake breeze

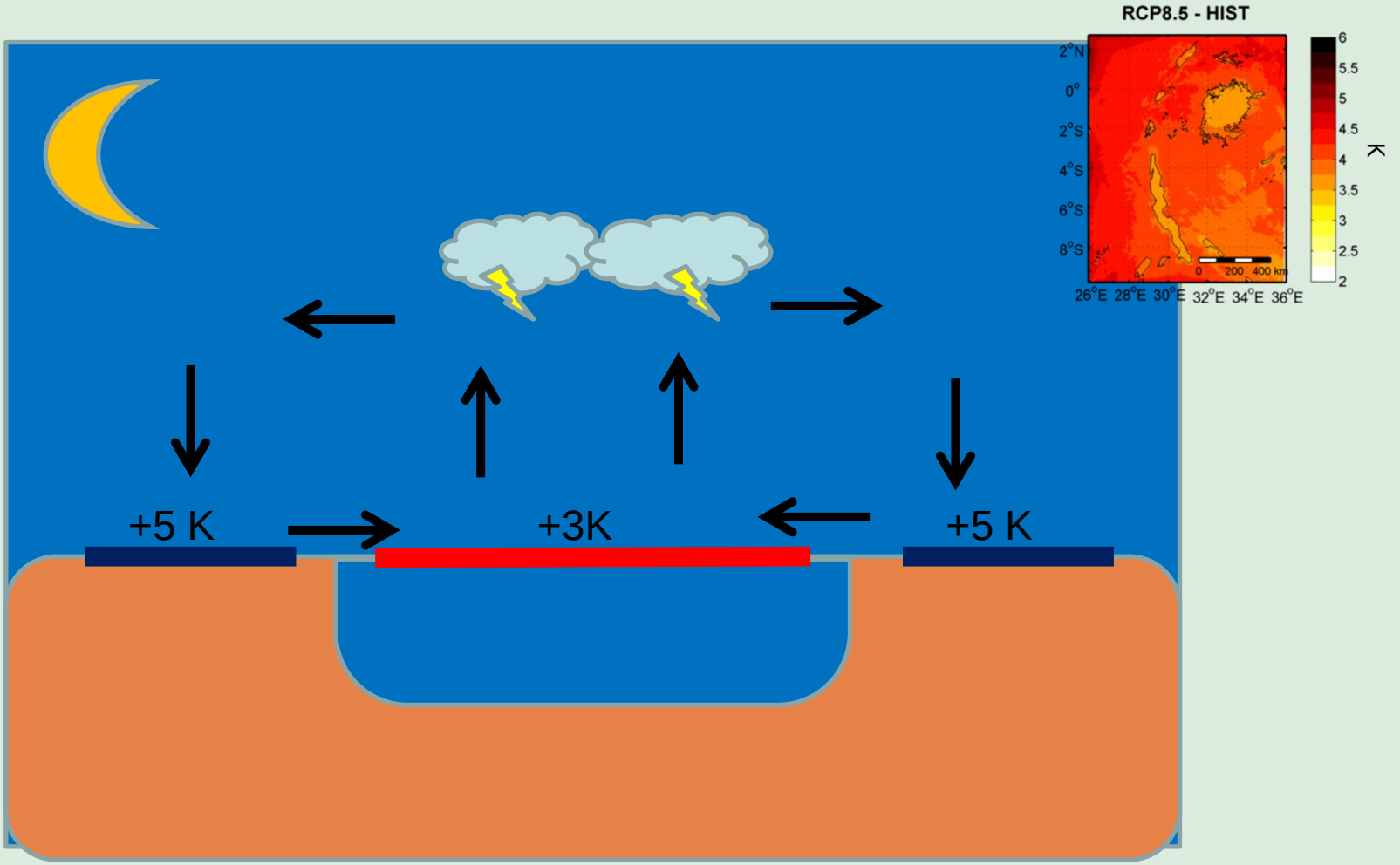


Land breeze



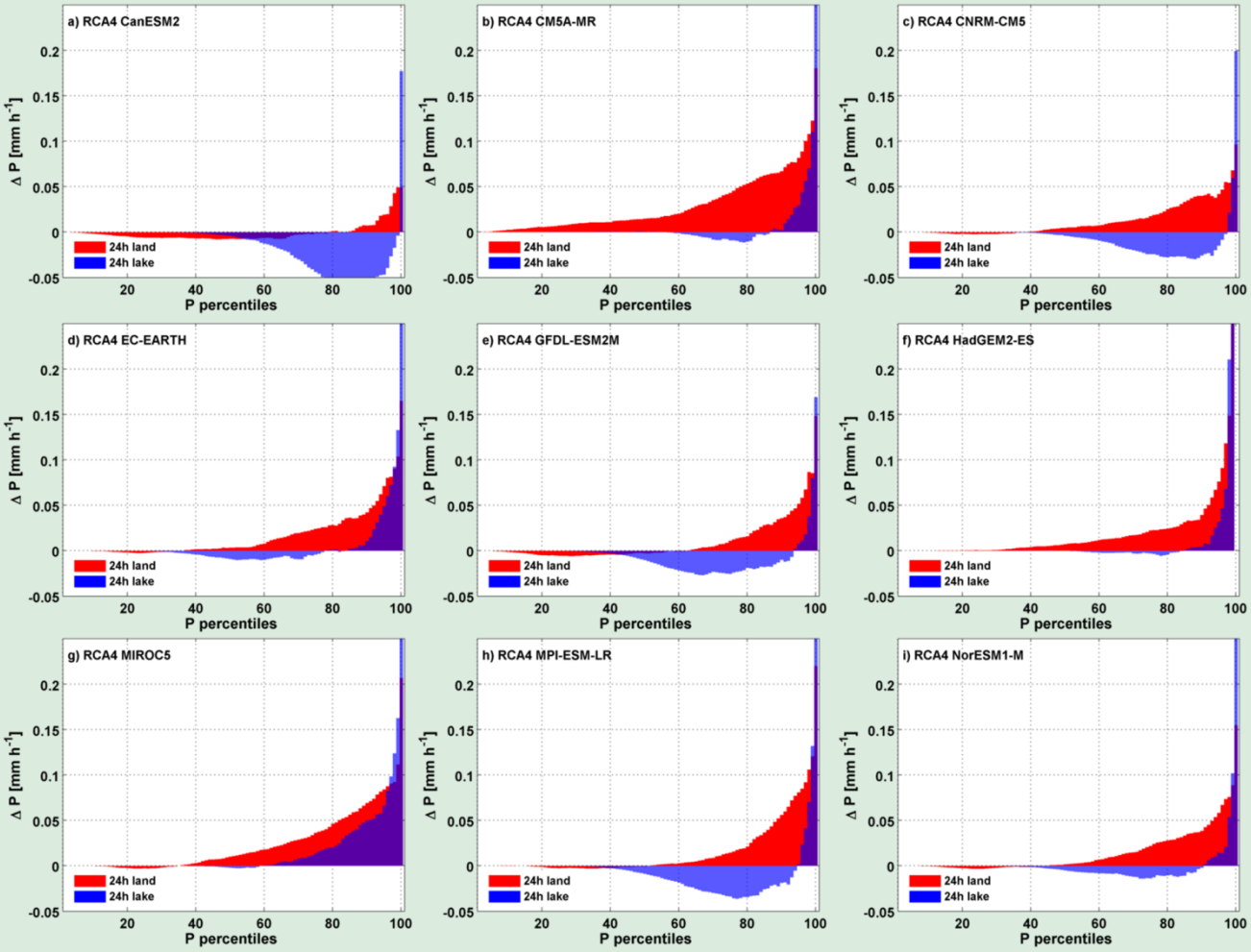
DEPARTMENT OF **EARTH AND ENVIRONMENTAL SCIENCES**
K.U.LEUVEN - BELGIUM

Land breeze



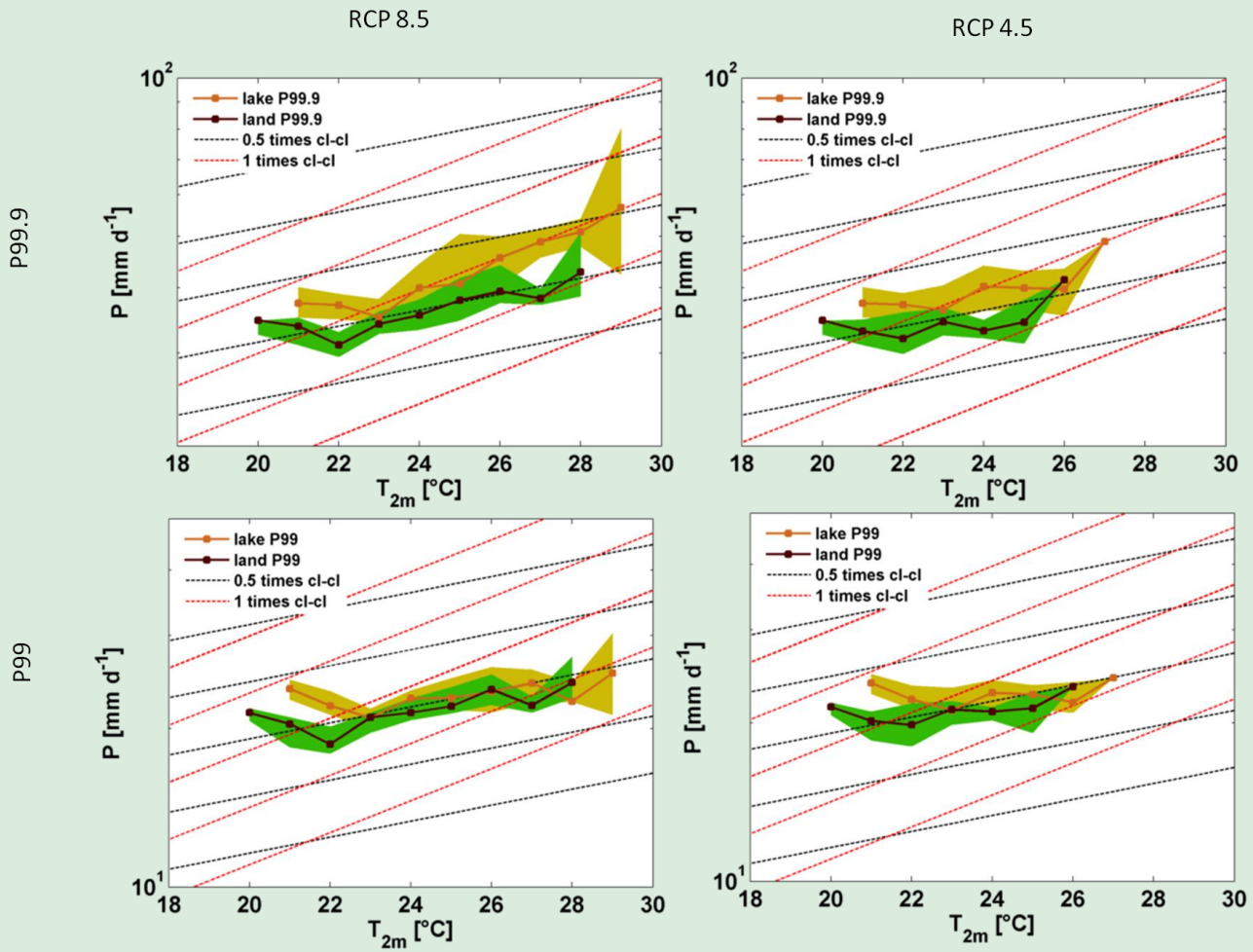
DEPARTMENT OF **EARTH AND ENVIRONMENTAL SCIENCES**
K.U.LEUVEN - BELGIUM

CORDEX ensemble: "CCLM² projections are robust"



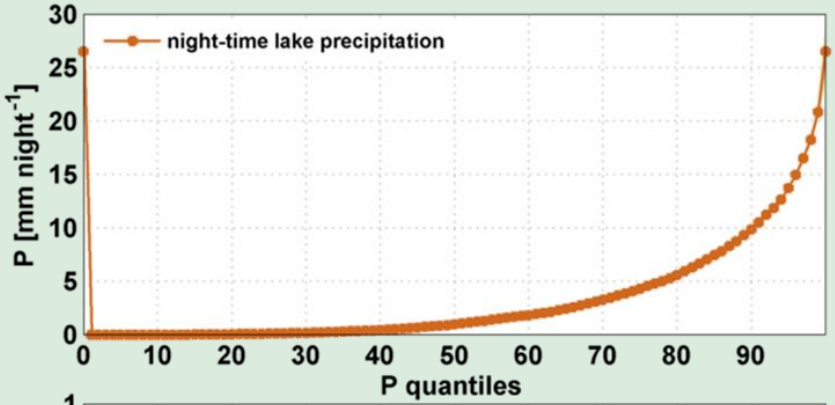
DEPARTMENT OF EARTH AND ENVIRONMENTAL SCIENCES
K.U.LEUVEN - BELGIUM

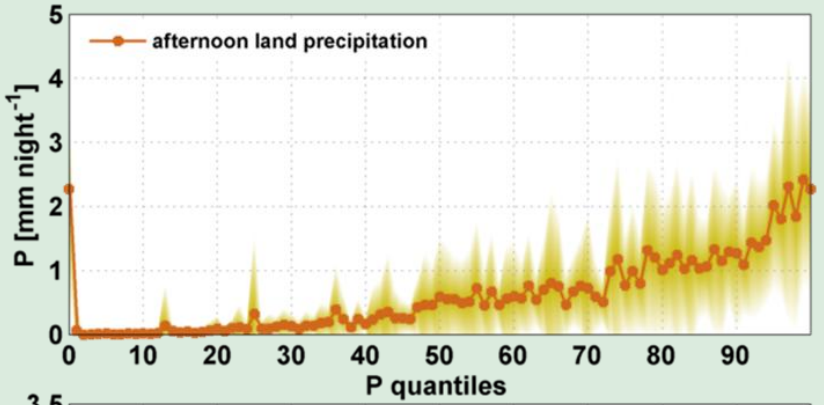
Sensitivity to scenario and percentile choice

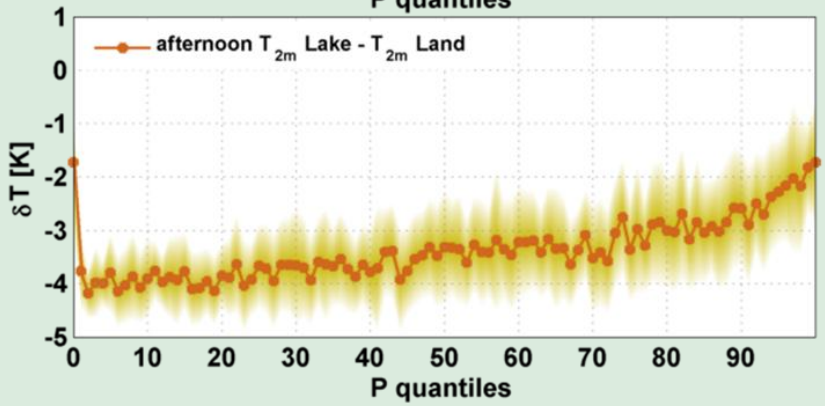


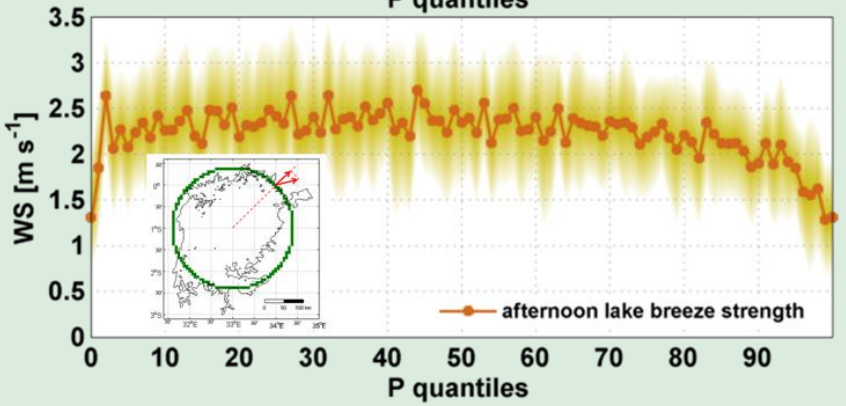
DEPARTMENT OF **EARTH AND ENVIRONMENTAL SCIENCES**
K.U.LEUVEN - BELGIUM

Causes for extremes in present: dynamics and themordynamics









Needs to be refined (e.g. geographically, processes,…)

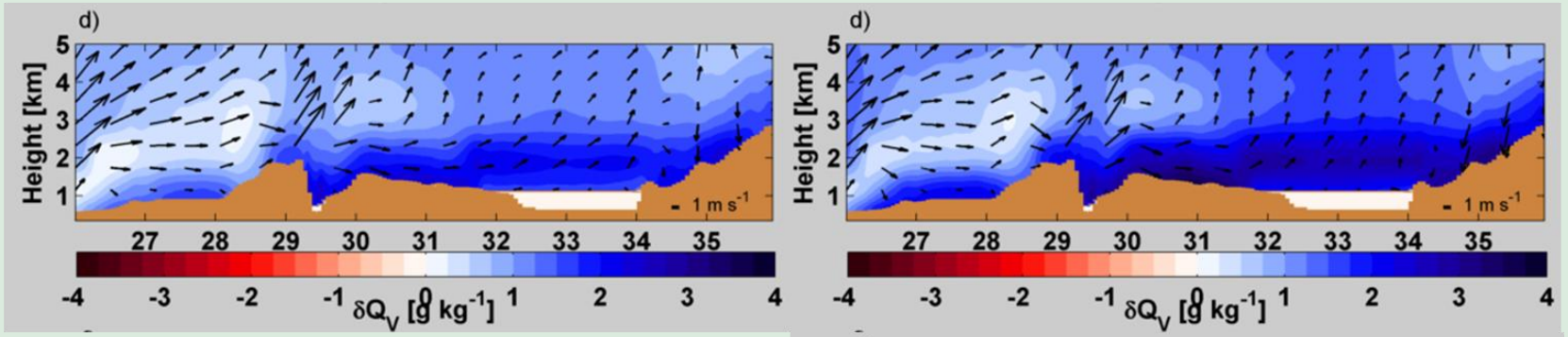
DEPARTMENT OF **EARTH AND ENVIRONMENTAL SCIENCES**
K.U.LEUVEN - BELGIUM

Causes for future change in extremes: Dynamics or thermodynamics?

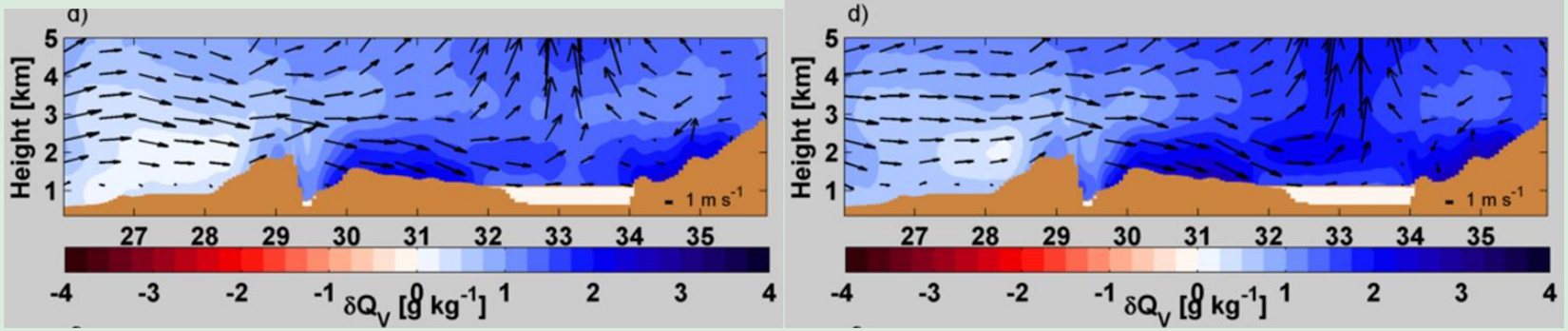
Extremes minus mean

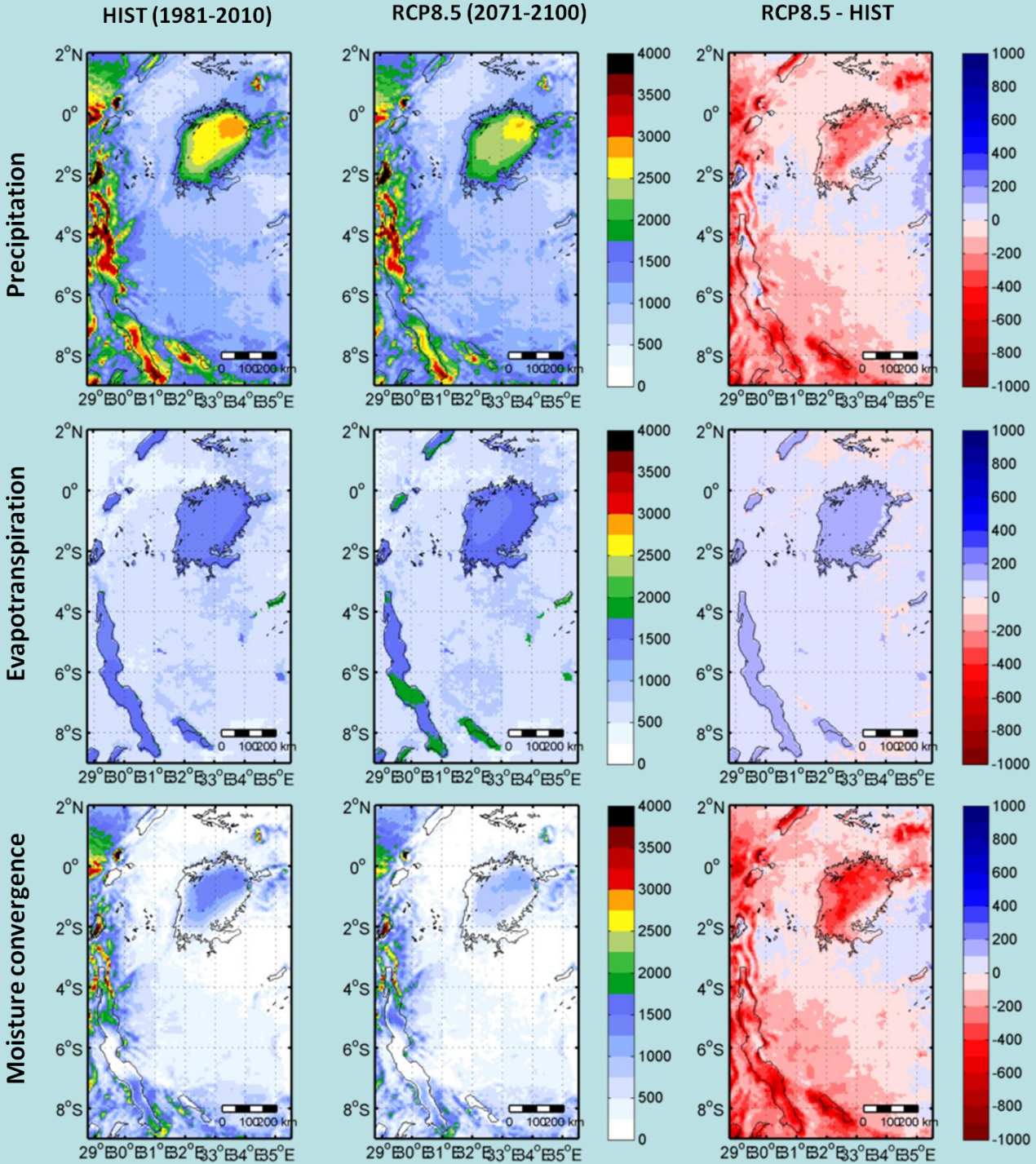
historical **RCP8.5**

day



night




HIST (1981-2010)
RCP8.5 (2071-2100)
RCP8.5 - HIST
Precipitation
Evapotranspiration
Moisture convergence
2°N
0°
2°S
4°S
6°S
8°S
29°E
30°E
31°E
32°E
33°E
34°E
35°E
0 100200 km
4000
3500
3000
2500
2000
1500
1000
500
0
1000
800
600
400
200
0
-200
-400
-600
-800
-1000